

# STRUCTURAL OVERVIEW

The whole issue of the **PHYSICAL** reality of the structural member

- 1 load to carry over what span,
- 2 material of member,
- 3 shape/geometry

## LOAD:

refers to the loading diagram of a specific member. Is it in tension, compression, shear bending... what are the magnitudes and the moments resulting?

$V_{\max}$  and  $M_{\max}$

$F_C$  = compressive strength

## MATERIAL:

Refers to the type of material we are using and therefore the the properties of the material; how ductile is it, what is its elastic range?

$F_T$  = tensile strength

$F_Y$  = yield strength

$F_b$  = bending strength

$E$  = Modulus of Elasticity

## GEOMETRY:

refers to the properties of the CROSS SECTION

$d$  = depth

$b$  = width

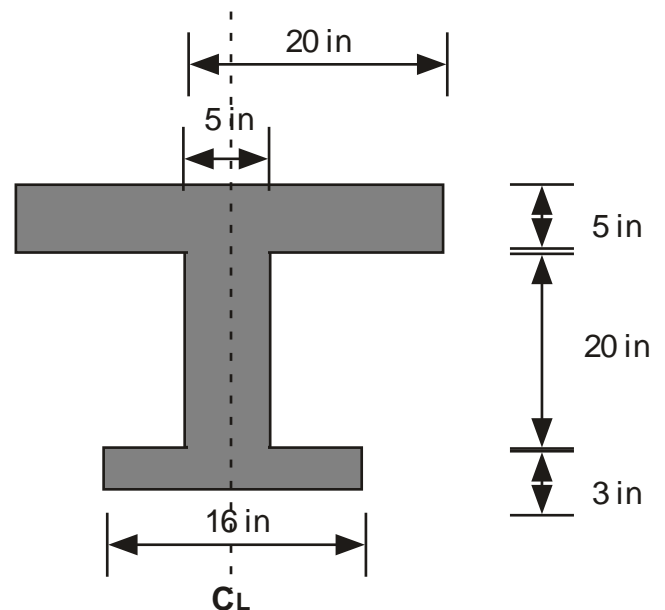
$\Phi$  = diameter of circular section

$A$  = cross sectional area

**Centroid**

**Moment of Inertia**

**Section Modulus**



## Loads defined

Approximate weights of Building Materials  
(Dead loads of the material itself from gravity)

Materials	Weight Pounds/Square foot	Materials	Weight Pounds/Square foot
<b>Floors</b>		<b>Floors</b>	
Steel Deck	2 - 10	Steel Deck	2 - 10
Concrete reinforcement 1 inch		Fills 1 inch	
Stone	12 1/2	Gypsum	6
Slag	11 1/2	Sand	8
Lightweight	6 - 10	Cinders	4
Concrete plain 1 inch		Finishes	
Stone	12	Terrazzo 1in	13
Slag	11	Ceramic tile 3/4 in	10
Lightweight	1 - 9	Linoleum 1/4 in	1
		Mastic 1/4 in	9
		Hardwood 7/8 in	4
		Softwood 3/4 in	2 1/2
<b>Roof</b>		<b>Partitions</b>	
Copper or tin	1 - 5	Wood studs 2 x 4	2
Corrugated Steel	1 - 5	12 - 16 inch on center	
3 ply ready roofing	1	Steel partitions	4
3 ply felt and gravel	5 1/2	Plaster 1 inch	
5 ply felt and gravel	6	Cement	10
Shingles		Gypsum	5
Wood	2	Lathing	
Asphalt	3	Metal	1/2
Clay Tile	9 - 12	Gypsum board 1/2 in	2
Slate 1/4 in	10		
Sheathing		<b>Walls</b>	
Wood 3/4 in	3	Brick	
Gypsum 1 in	4	4 inch	40
Insulation		8 inch	80
Loose	1/2	12 inch	120
Poured in place	2	Stone 4 inch	55
Rigid	1 1/2	Glass Block 4 inch	18
		Windows (glass, frame & sash)	8
		Structural glass 1 inch	15

# LIVE LOAD RANGES FOR STRUCTURAL SYSTEMS

*(LIVE loads of the moving things on a floor system)*

## LIVE LOAD RANGES FOR BUILDING OCCUPANCIES

Occupancy	Light Loads		Medium Loads		Heavy Loads	Very Heavy Loads
	20 psf	60 psf	100 psf	150 psf	250psf	
Assembly areas		fixed seats	movable seats			
Building Corridors		private	stage areas public			
Garages		passenger cars		trucks & buses		
Hospitals		private rooms	operating rooms			
Hotels and Apts		private rooms	laboratories public rooms			
Libraries			reading rooms	stacks		
Manufacturing				light	heavy	
Office Buildings		offices	lobbies			
1 & 2 story dwellings	attics	bedrooms	living spaces			
Outdoor areas				pedestrian	vehicular	
Roof Loads	no snow	moderate snow	high mountains			
Storage areas			pedestrian	light	heavy	
Schools		classrooms	assembly	shops		
Stores			retail	wholesale		
Misc. Public Facilities	penal institutions	bowling alleys	gymnasiums dance halls	armories		
	cell blocks	poolrooms	dining rooms restaurants stadium skating rinks	drill rooms		

# PRACTICAL SPAN RANGES FOR STRUCTURAL SYSTEMS

Structural System		span range							
		10 ft 3 m	20 ft 6 m	30 ft 9 m	50 ft 15 m	100 ft 30 m	200 ft 60 m	300 ft 90 m	500 ft 150m
<b>WOOD</b>	joist	10 ft							
	decking	10 ft	20 ft						
	solid beams	10 ft	20 ft	30 ft					
	rafter pairs	10 ft	20 ft	30 ft	50 ft				
	light floor trusses	10 ft	20 ft	30 ft	50 ft				
	light roof trusses		20 ft	30 ft	50 ft				
	glue laminated beams		20 ft	30 ft	50 ft	100 ft			
	heavy trusses			30 ft	50 ft	100 ft	200 ft		
	domes				50 ft	100 ft	200 ft	300 ft	500 ft
<b>Brick &amp; Concrete Masonry</b>	lintels	10 ft							
	arches							300 ft	
<b>STEEL</b>	corrugated decking	10 ft							
	light gage joists	10 ft	20 ft						
	beams	10 ft	20 ft	30 ft	50 ft				
	open web joists	10 ft	20 ft	30 ft	50 ft	100 ft			
	single story rigid frames			30 ft	50 ft	100 ft			
	heavy trusses			30 ft	50 ft	100 ft	200 ft		
	arches and vaults				50 ft	100 ft	200 ft	300 ft	
	space frames				50 ft	100 ft	200 ft	300 ft	500 ft
	domes				50 ft	100 ft	200 ft	300 ft	500 ft
	cables stayed				50 ft	100 ft	200 ft	300 ft	500 ft
	suspension				50 ft	100 ft	200 ft	300 ft	500 ft
<b>SITECAST CONCRETE</b>	one-way slab	10 ft							
	two way slab	10 ft	20 ft						
	one-way joists		20 ft	30 ft					
	waffle slab			30 ft	50 ft				
	beams	10 ft	20 ft	30 ft	50 ft				
	folded plates & shells				50 ft	100 ft			
	domes				50 ft	100 ft	200 ft		
	arches				50 ft	100 ft	200 ft		
<b>PRECAST CONCRETE</b>	slabs	10 ft	20 ft	30 ft	50 ft				
	beams		20 ft	30 ft	50 ft				
	doubles tees	10 ft	20 ft	30 ft	50 ft	100 ft			
	single tees			30 ft	50 ft	100 ft			
<b>PNEUMATIC</b>	air inflated	10 ft	20 ft	30 ft	50 ft				
	air supported			30 ft	50 ft	100 ft	200 ft	300 ft	500 ft